

8.0 CONCLUSIONS

8.1 APPROACH

The analysis in the preceding sections of this Opinion forms the basis for conclusions as to whether the proposed action, the ongoing operation of the FCRPS and the USBR projects identified in Table 1.1, satisfies the standards of ESA Section 7(a)(2). To do so, the Action Agencies must ensure that their proposed action is not likely to jeopardize the continued existence of any listed species or destroy or adversely modify the designated critical habitat of such species. Section 4.0 of this Opinion defines the biological requirements and the current range-wide status of each of the 12 listed salmonid species and one species proposed for listing. Section 5.0 evaluates the relevance of the environmental baseline to each species' current status. Section 6.0 details the likely effects of the proposed action on individuals of the species in the action area, on the listed populations across their range and life cycle, and on designated critical habitat. Section 7.0 considers the cumulative effects of relevant non-Federal actions reasonably certain to occur within the action area. On the basis of this information and analysis, NOAA Fisheries draws its conclusions about the effects of the FCRPS and the USBR projects on the likelihood of both the survival and recovery of the 12 listed and one proposed species of Columbia River salmonids, as well as the effects on critical habitat.

8.1.1 Jeopardy Analysis

As discussed in Section 1.2.5 of this Opinion, NOAA Fisheries must now determine whether any reductions of the species' productivity, numbers, or distribution caused by the proposed action reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the listed species or result in the destruction or adverse modification of critical habitat. Where the analysis in Section 6.0 indicates that there are not likely to be any net adverse effects to an ESU from the proposed action, NOAA Fisheries' conclusion will necessarily be that the action is not likely to jeopardize the ESU's continued existence. A reduction in the likelihood of both survival and recovery cannot occur if there is no net reduction in the productivity, numbers, or distribution of that ESU, consistent with the regulatory definition of "jeopardize the continued existence" (50 CFR § 402.02). Similarly, for the critical habitat determination, if there is no net adverse alteration of any essential features of critical habitat, there can be no adverse modification of that habitat. Although there may be no net adverse effect to an ESU or its habitat, NOAA Fisheries nevertheless reviews the factors relevant to the "appreciable reduction" and "adverse modification" determinations for that ESU to provide the full context for this analysis.

The information available to NOAA Fisheries for this determination is both quantitative and qualitative. For some species, such as SR spring/summer chinook salmon, the available information includes substantial quantitative data based on empirical observations. For other species, such as SR sockeye salmon and several lower river ESUs, the available information is largely qualitative, based on the best professional judgment of knowledgeable scientists. Despite an increasing trend toward a more quantitative understanding of the critical life signs for these fish, critical uncertainties limit NOAA Fisheries' ability to project future conditions and effects.

As a result, no absolute numerical indices are available for any of these stocks on which NOAA Fisheries can base determinations about jeopardy or the adverse modification of critical habitat (the Section 7(a)(2) standards). Ultimately, for all 13 ESUs, NOAA Fisheries' conclusions are qualitative judgments based on the best quantitative and qualitative information available for each species.

As described in Section 1.2.5 and Section 6.0, NOAA Fisheries considers effects of an action on an ESU by first considering effects on individual populations, then on major population groups identified by Technical Recovery Teams (TRTs), and finally on the ESU as a whole. Effects on populations and major population groups were described in Section 6.0. In judging whether a reduction in the numbers, productivity, or distribution of an ESU constitutes an appreciable reduction in the likelihood of the ESU's survival and recovery, NOAA Fisheries considers the following factors:

Number of Major Population Groups in the ESU. ESUs with only one or two major population groups are more likely than ESUs with several major population groups to be reliant on individual populations for recovery or even continued survival (e.g., in the face of major catastrophic events). The smaller the number of major population groups in an ESU, the more likely that a reduction in numbers, productivity, or distribution of one or more groups would constitute an appreciable reduction in the ESU's likelihood of survival and recovery.

Proportion of Major Population Groups with Reduced Numbers, Productivity, or Distribution. The higher the percentage of major population groups in an ESU with a reduction in numbers, productivity, or distribution, the more likely this would constitute an appreciable reduction in the ESU's likelihood of survival and recovery. Conversely, the smaller the proportion of groups with an adverse effect, the less likely there would be an appreciable reduction.

Magnitude of the Reduction for Affected Major Population Group(s). A large reduction in numbers, productivity, or distribution for the affected population group(s) would be more likely than a small reduction to constitute an appreciable reduction in the ESU's likelihood of survival and recovery. As described in Section 6.0, in determining the magnitude of the reduction, it is relevant to consider the relative timing of adverse and beneficial components of the proposed action.

Range-wide Status of the ESU. An endangered ESU would presumably have less capacity for reduction in numbers, productivity, or distribution than a threatened ESU. Similarly, an endangered or threatened ESU that has been declining significantly in recent years would have less capacity for reduction in numbers, productivity, or distribution than an ESU with an increasing population trend. Therefore, it is more likely that a reduction will be considered 'appreciable' for endangered than for threatened ESUs and for declining rather than relatively stable or increasing ESUs.

If the beneficial effects of some components of the proposed action will be delayed relative to the proposed action's adverse effects, NOAA Fisheries must consider the status and viability of the population during the lag period. There would be an appreciable reduction in the likelihood

of survival and recovery if population abundance or productivity were too low during the lag period to respond to later beneficial effects.

Status of the ESU in the Action Area (Environmental Baseline). The extent to which an ESU's biological requirements are not being fully met within the action area is relevant to that ESU's capacity to tolerate additional similar adverse effects. The extent of the action area relative to the range-wide distribution of the ESU is also relevant. The greater the proportion of the range of the ESU represented by the action area, the more significant is the status of the ESU within the range to the "appreciable reduction" determination. In summary, NOAA Fisheries would be more likely to conclude that a reduction in numbers, productivity, or distribution is an appreciable reduction in the likelihood of both survival and recovery if the status of the ESU in the action area is poor relative to its biological requirements and if the action area represents a significant proportion of the ESU's range.

Impact of Cumulative Effects on the Status of the ESU in the Action Area. NOAA Fisheries must consider the influence of non-Federal actions that are reasonably certain to occur in the action area. The key question is whether inclusion of cumulative effects modifies the characterization of the status of an ESU in the action area.

Uncertainty. Available science is unable to resolve significant uncertainty in all parts of this analysis. NOAA Fisheries must identify and acknowledge the full range of scientific uncertainty in reaching its final conclusion. Where scientific gaps remain, NOAA Fisheries is expected to provide the benefit of the doubt to the listed species (ESA Section 7 Consultation Handbook, p. 1-6). A key question is whether or not the uncertainty is greater in the analysis of the presumed positive effects of non-hydro offsets compared to presumed negative effects of hydro operations, or if the level of uncertainty is comparable. Therefore, NOAA Fisheries has taken a conservative approach to estimate the benefit of the proposed action.

8.1.2 Analysis of Adverse Modification of Critical Habitat

If NOAA Fisheries determines in Section 6.0 that the proposed action alters an essential feature of designated critical habitat, NOAA Fisheries then evaluates whether the alteration would constitute the destruction or adverse modification of designated critical habitat by appreciably diminishing the value of critical habitat for survival or recovery. In determining whether an alteration of an essential feature of critical habitat would also appreciably diminish the value of critical habitat for survival or recovery, NOAA Fisheries considers the magnitude and duration of the alteration, the condition of critical habitat in the action area under the environmental baseline and cumulative effects, the likely purpose of the affected essential feature for survival and recovery, the status of the ESU across its range and within the action area, and the amount of uncertainty presented by the available scientific data and analyses.

8.1.3 Summary of Conclusions for All ESUs

Conclusions for the 13 ESUs are summarized in Table 8.1. Details regarding those conclusions are discussed in Sections 8.2 through 8.14.

Table 8.1. Summary of conclusions.

ESU	ESU Net Effect - Change in Numbers, Reproduction, or Distribution? ¹	ESU Jeopardy Determination - Appreciable Reduction in Likelihood of Survival and Recovery?	ESU Adverse Modification Determination
SR Spring/Summer Chinook	Reduce (short-term)	Not likely to jeopardize	Not likely to adversely modify
SR Fall Chinook	Reduce (short-term)	Not likely to jeopardize	Not likely to adversely modify
UCR Spring Chinook	Reduce (short-term)	Not likely to jeopardize	N/A
LCR Chinook	Reduce (short-term)	Not likely to jeopardize	N/A
UWR Chinook	No Change	Not likely to jeopardize	N/A
SR Steelhead	Reduce (short-term)	Not likely to jeopardize	N/A
UCR Steelhead	Reduce (short-term)	Not likely to jeopardize	N/A
MCR Steelhead	Reduce (short-term)	Not likely to jeopardize	N/A
UWR Steelhead	No Change	Not likely to jeopardize	N/A
LCR Steelhead	Reduce (short-term)	Not likely to jeopardize	N/A
CR Chum	Reduce (short-term) to NC ²	Not likely to jeopardize	N/A
LCR Coho	No Change	Not likely to jeopardize	N/A
SR Sockeye	Reduce (short-term)	Not likely to jeopardize	Not likely to adversely modify

8.1.4 Supplemental Consultations for USBR Projects in Occupied Habitat

As part of the UPA and consistent with the action proposed for the 2000 Biological Opinion and its resulting RPA, these conclusions also apply to the effects of 19 USBR projects that all have

¹ “Short-term” refers to a reduction that persists no longer than 2010.

² As described in Section 6.13, it is unknown whether or not there is an extant population of SR chum salmon above Bonneville dam. If such a population exists, there would be a short-term reduction. If a population does not exist above Bonneville Dam, there would be no change between the reference and proposed action.

effects on the mainstem Columbia River. For many of these projects, the only effects on the affected ESUs occur in the mainstem (e.g. the Montana, Columbia Basin, The Dalles, and Chief Joseph projects). Other USBR irrigation projects located in watersheds inhabited by listed salmonids could affect spawning and egg-to-smolt life stages: the Okanogan, Yakima, Umatilla, Deschutes, Wapinitia, Tualatin, and Lewiston Orchards projects. The 2000 Biological Opinion, RPA Action 30, called for supplemental consultations during which USBR would provide further detail about these projects and their tributary effects in supplemental biological assessments. NOAA Fisheries would then consider those effects, as well as any further information about the mainstem effects of those projects, and provide supplemental biological opinions for each such project. Since 2000, NOAA Fisheries and USBR have completed a supplemental consultation for the Umatilla Irrigation Project. The USBR now proposes in its UPA, Appendix B, to continue with supplemental consultations for the remainder of these projects. Most of these supplemental consultations are now under way, as discussed in the UPA, Appendix B. The conclusions in this Opinion for these USBR projects, therefore, will be further refined by these supplemental consultations.

8.2 SR SPRING/SUMMER CHINOOK SALMON

After reviewing the current status of SR spring/summer chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species or adversely modify or destroy designated critical habitat.

Magnitude of Reduction(s): The net combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would reduce numbers and productivity by a Low amount for the five major population groups in this ESU (Section 6.0) initially. Beneficial actions that are phased in during the term of the proposed action would be expected to reduce the negative effects to "no change" by 2010-2014.

Number of Major Population Groups: The presence of five major population groups in this ESU (Section 4.0) makes it is less likely that any single group is significant for this ESU's viability, compared to ESUs with fewer major population groups.

Proportion of Major Population Groups Reduced: The net combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers and productivity by a Low amount for all five major population groups in this ESU (Section 6.0). Beneficial actions such as configuration changes and non-hydro actions that would be phased in during the term of the proposed action would be expected to reduce the negative effects to "no change" by 2010-2014.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that, through 2001, most populations experienced long-term declines, but short-term trends were positive for many populations. The short-term productivity trends for the majority of the natural production areas in the ESU are at or above replacement. Dam counts and preliminary spawner surveys also indicate higher than average abundance in 2002 and 2003. The recent 10-year average is approximately twice the previous 10-year average for combined

hatchery and wild adults passing Lower Granite Dam. The BRT concluded that the natural component of the ESU had moderately high risk in the abundance and productivity VSP categories and comparatively low risk for spatial structure and diversity. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that SR spring/summer chinook salmon artificial production programs provide benefits to ESU abundance, spatial structure, and diversity but have neutral or uncertain effects on ESU productivity. Collectively, hatchery programs do not substantially reduce the long-term extinction risk of the ESU. However, the existing safety net program is effective at reducing the short-term risk of extinction (see Section 6.3.2.3).

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, and the existing structures and facilities result in high levels of mortality for juvenile fish migrating toward the ocean. Beginning in the 1980s and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams and USBR projects, along with mainstem harvest rates, are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: Direct adult and juvenile survival rates through FCRPS projects are known with relative certainty for SR spring/summer chinook salmon. These estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of the dams and non-discretionary hydro operations). The precision with which NOAA Fisheries

can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies' discretion and to define and model a reference operation that would maximize the survival of listed fish. The average post-Bonneville differential survival of transported juveniles (D) relative to non-transported juveniles is fairly well known for this ESU, based on the large sample sizes attained in the empirical studies conducted in recent years. NOAA Fisheries' estimate of the magnitude of the latent mortality of in-river migrants, including any differences in latent mortality between the reference and proposed operation, is highly uncertain. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed hydro action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, NOAA Fisheries' estimate of the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. A Very Low improvement was assumed in the net effects analysis from tributary habitat restoration, reflecting the uncertainty associated with predicting the effects of the proposed activities on this ESU.

Summary: There is a mix of high and low risk considerations for the SR spring/summer chinook ESU, both range-wide and in the action area. High mortality in the action area, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), indicates relatively high risk. However, recent adult returns and short-term productivity trends that are at or above replacement indicate reduced range-wide risk, at least in the short term, and thus some tolerance for additional short-term risk. While the net reduction would be Low early in the term of the proposed action, beneficial actions would reduce the effect to "no change" and perhaps to a net improvement by 2010 and beyond. Strong returns of adults during the past four years suggest that a short-term lag in achieving beneficial effects would not have serious consequences. For these reasons, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

Critical Habitat: As described in Section 6.3.3.2, using the Environmental Baseline Approach, the proposed action negatively impacts the essential habitat feature of safe passage in the juvenile migration corridor between 2005-2009 but results in a net improvement in safe passage conditions between 2010-2014. The magnitude of the reduction in safe passage (relative to the reference operation) during the first five years is significant, even considering the immediate improvement in safe passage that would result from expansion of the northern pikeminnow removal program. The magnitude of expected improvements in mainstem habitat function during the second five years would also be significant. The purpose of safe passage, relative to "survival or recovery" of listed species, is survival through the migratory corridor at a rate sufficient to

support increasing populations up to at least a recovery level. The in-river survival rate necessary for recovery is currently unknown.

Safe passage and other essential features of critical habitat in the juvenile migration corridor habitat under the environmental baseline are poor. The juvenile migration corridor has been greatly modified by the existence of the FCRPS dams, reservoirs, and non-discretionary hydro operations, as described in Section 5.0. A significant proportion of the migrating juveniles is transported around most FCRPS dams in order to avoid the baseline passage conditions. No actions that are properly considered cumulative effects are expected to change the status of critical habitat in the juvenile migration corridor. The range-wide status of the ESU is described above. It is characterized by a mixture of a long-term decline in abundance and productivity, short-term improvements in abundance and productivity over the past three to four years, and current abundance levels that are below interim recovery targets.

NOAA Fisheries expects that the proposed action would have positive effects on critical habitat in the upper Salmon, Little Salmon, and Lemhi subbasins. Cumulative effects would be a mixture of positive and negative changes in essential features of critical habitat in these tributary spawning and juvenile rearing areas.

After considering all of these factors, NOAA Fisheries concludes that the proposed action would not be likely to adversely modify or destroy designated critical habitat for this ESU. This conclusion is based primarily on the determination that, by the sixth year of this proposed action, the condition of critical habitat in the juvenile migration corridor would be improved beyond both the current condition and the condition associated with the reference operation. Some of the most significant improvements would be structural modifications to dams that would be expected to remain in place long after 2014. Therefore, the proposed action is not likely to appreciably reduce the value of critical habitat for survival or recovery on a time scale relevant to the recovery of the ESU, especially in light of the recent (short-term) improvement in the status of the ESU.

Under the Listing Condition Approach applied in Section 6.0, there is no adverse modification or destruction of critical habitat possible because there is not likely to be any alteration of essential features of critical habitat below their condition at the time this ESU was listed.

8.3 SR FALL CHINOOK SALMON

After reviewing the current status of SR fall chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would have the net effect of initially reducing numbers and productivity by a Medium amount for the single extant population in this ESU (Section 6.0). Beneficial actions that would be phased in during the term of the proposed action would be

expected to reduce the negative effects to “no change” or possibly an improvement by 2010-2014.

Number of Major Population Groups: There is only one population and therefore one major population group in this ESU (Section 4.0), which makes it significant for this ESU’s viability.

Proportion of Major Population Groups Reduced: The combination of discretionary hydro operations, hydro configuration changes, and off-site actions would initially reduce the numbers, productivity, and distribution of the single extant population in this ESU. Beneficial actions that would be phased in during the term of the proposed action would be expected to reduce the negative effects to “no change” or possibly an improvement by 2010-2014.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that, through 2001, the natural component of this ESU had experienced long-term declines, but the short-term trend was positive. The June 14, 2004, Status Review indicated that, depending upon the assumption made about the likelihood of the progeny of hatchery fish returning as productive adults, long- and short-term trends in productivity are at or above replacement. Dam counts and preliminary spawner surveys also indicate higher than average abundance in 2002 and 2003. In fact, the four years 2001-2003 have resulted in the highest returns of naturally produced spawners to areas above Lower Granite Dam since the early 1960s, shortly after access to spawning areas above Hells Canyon was lost (Section 4.0). The BRT was concerned that overall abundance of natural spawners has been low in spite of recent improvements and concluded that the natural component of the ESU had moderately high risk for all VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that SR fall chinook salmon artificial production programs provide slight benefits to ESU abundance, spatial structure, and diversity but have neutral or uncertain effects on ESU productivity. Overall, hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor, resulting in high levels of mortality for juvenile SR fall chinook migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams and USBR projects, along with mainstem harvest rates, are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private

actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: Direct adult survival rates through the FCRPS are known with relative certainty. As described in Sections 5.0 and 6.0, the survival of juveniles through the FCRPS, especially the effects of FCRPS passage or transport on survival below Bonneville Dam, are not well known. There is also uncertainty regarding the life history strategy followed by SR fall chinook (Section 6.4.1). Empirical information regarding survival rates of SR fall chinook is available only for the subyearling migration strategy, but recent information suggests that a significant portion of returning adults emigrated as yearlings. An analysis that evaluates the sensitivity of conclusions to different proportions of yearlings in the ESU is included in Section 6.0. In addition, there is uncertainty regarding the survival of juveniles through the FCRPS. For instance, Williams *et al.* (2004) state that “no empirical evidence exists to suggest that transportation either harms or helps fall chinook salmon.” Nevertheless, NOAA Fisheries continues to believe that, in light of the increasing trend in returning adults, maximizing transportation of fall chinook continues to be the best method of insuring their survival and recovery until more definitive information can be gathered that indicates there is a better alternate operation. Accordingly, the reference operation (as described in Appendix D) would call upon the Action Agencies to continue the current efforts to maximize fall chinook collection and transportation.

The survival estimates described herein represent a combination of the proposed hydro operation and the environmental baseline (i.e., existence of the hydro system and non-discretionary hydro operations). NOAA Fisheries’ ability to distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies’ discretion and to define and model a reference operation that would maximize the survival of listed fish.

Further uncertainty is due to the fact that there are few estimates of the effects of configuration improvements on subyearling chinook, so that NOAA Fisheries must infer the benefits of RSWs and other passage improvements from data for other ESUs. There are also no quantitative estimates of the effect of the proposed action on this ESU below Bonneville Dam. An analysis that evaluates the influence of extrapolating Snake River reach survival rates to the lower Columbia is included in Section 6.0. While specific effects of hydro operations on estuary and

plume habitat are uncertain, the relatively large difference in summer flows and lack of a difference in water quality between the reference and proposed operations are fairly certain.

Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. There was uncertainty associated with the magnitude of effects of the estuary improvement actions on this ESU. The determination that artificial propagation measures will increase the viability of the ESU by a Low amount is also uncertain.

Summary: In general, there is high risk for the SR fall chinook ESU, both range-wide and in the action area. Significant risk factors include the presence of only one extant population in the ESU and the high mortality rate in the action area, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation). One factor that indicates at least a short-term reduction in risk is the record adult return numbers in the last four years. The June 14, 2004, Status Review indicated that, depending upon the assumption made about the likelihood of the progeny of hatchery fish returning as productive adults, long- and short-term trends in productivity are at or above replacement. These recent results are encouraging and signal at least a short-term improvement in the range-wide trend. The main consideration in determining if the proposed action constitutes an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action poses an additional risk to the ESU.

No difference in adult survival would be expected as a result of implementing the proposed action.

For juvenile SR fall chinook, the activities that differentiate the proposed and reference operations would primarily affect the relatively small proportion of fish that migrates through lower Columbia dams and reservoirs. Transported fish, and the juveniles that die or hold over in the river en route to collector sites in the Snake River, are expected to experience nearly identical survival rates under the proposed and reference operations. Survival of the small fraction of the population that migrates through the lower Columbia River is expected to be lower under the proposed action but, when placed in the context of a reasonable range of effects on transported fish, it is likely that the population as a whole is minimally affected by the proposed action. Results indicate that, initially, both survival of in-river migrants and that of the population as a whole would be expected to be lower than survival under the reference operation, with that difference constituting a Medium impact. That impact would be approximately a 2-3% reduction in survival for the entire population, as described in Section 6.4, which would place it at the lowest end of the Medium category. Non-hydro actions do not appear sufficient to offset this effect in the first few years of the proposed action. However, by 2010, various hydro improvements and non-hydro offsets would be expected to result in improved hydro survival, and the reduction for the entire population would be 2% or less. Non-hydro actions such as

estuary habitat improvements, predator reductions, and hatchery programs should offset the hydro impacts and result in no net change, or possibly an improvement in survival, by 2010.

There is uncertainty both in NOAA Fisheries' estimates of the negative effects of the proposed action and of the likely beneficial effects. Key uncertainties relate to various factors affecting juvenile survival rates, the degree to which compensatory responses might negate some benefits of predator removal, and the efficacy of habitat restoration projects. Sensitivity analyses generally indicate that the conclusions stated above are robust to a range of reasonable assumptions.

The question of whether the difference in juvenile survival during the first few years of implementing the proposed action would represent an appreciable reduction in the likelihood of survival and recovery is largely influenced by the recent trend in adult abundance and productivity. It is encouraging that the June 14, 2004 Status Review indicated that, depending upon the assumption made about the likelihood of the progeny of hatchery fish returning as productive adults, long- and short-term trends in productivity are at or above replacement. The progeny of the strong returns of adults during the past four years will be returning as adults over the next several years. While NOAA Fisheries does not yet know the survival rates that these upcoming broods are experiencing, the high numbers of spawners during the last few years suggest that initial production of eggs and early life stages likely was above average. Even average survival rates, coupled with above-average initial production, would result in above-average adult returns over the next few brood cycles. Although NOAA Fisheries' notice of proposed listings concluded that current hatchery operations do not substantially reduce extinction risk, ongoing hatchery programs do help to reduce concerns of extinction in the immediate future. In summary, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

Critical Habitat: As described in Section 6.4.3.2, using the Environmental Baseline Approach, the "safe passage" essential feature in the juvenile migration corridor during this period would be negatively altered, compared to the reference operation, because spill rates and flows would be lower in the proposed operation than in the reference operation. However, for the reasons stated below, this impact does not appreciably diminish the value of the habitat for this ESU as it relates to either its survival, because so few fish are actually affected by it, or its recovery, because the same rate of safe passage possible under the environmental baseline remains available into the future.

As described above under "Summary," only a small portion of the fish within this ESU actually complete their juvenile migration entirely in-river during the summer migration season because of the juvenile transportation program. In a typical year, about half of the juvenile migrants are transported. The remaining juvenile in-river migrants may voluntarily rear in reservoirs (holding over to migrate in the early spring as larger fish), die as result of dam or reservoir passage, or survive to below Bonneville Dam. In comparing the proposed action to the reference operation, almost all of the difference in "safe passage" conditions results from conditions primarily due to reductions in spillway passage that occur between Lower Monumental Dam and the unimpounded river below Bonneville Dam, and the proportion of the population exposed to those conditions is very small.

Safe passage and other essential features of critical habitat in the juvenile migration corridor habitat are poor under the environmental baseline. The juvenile migration corridor has been greatly modified by the existence of the FCRPS dams, reservoirs, and non-discretionary hydro operations, as described in Section 5.0. The effect of the proposed action on those juvenile fall chinook that choose to migrate as sub-yearlings, as compared to the reference operation, is a further degradation of the “safe passage” characteristic of the habitat in the 2005-2009 period. In the 2010-2014 time period, the passage improvements in the proposed action help offset that degradation. However, the model results estimating in-river survival still show about a 10% relative (2% absolute) difference in in-river survival between the reference operation and the proposed action in the 2010-2014 time period if all fish are assumed to migrate as sub-yearlings and if an extrapolation of empirical reach survival estimates from the Snake to lower Columbia River is appropriate. As described above and in Section 6.4, sensitivity analyses to investigate the effects of uncertainty in these assumptions indicate that the impact could be lower.

The question then becomes whether a small diminishment in the “safe passage” characteristic of the in-river critical habitat for SR fall chinook constitutes an appreciable reduction in the value of critical habitat for either survival or recovery of the ESU. In this case, because the in-river survival change indicative of safe passage only affects a small proportion of the total juvenile migrants, given that the remaining juvenile migrants either residualize, die during dam and reservoir passage, or are transported, NOAA Fisheries concludes that the effect on the critical habitat, while negative, does not appreciably reduce the value of that habitat as it relates to the survival of this ESU.

When considering whether the alteration of safe passage by the proposed action appreciably diminishes the value of critical habitat for recovery, it is relevant to consider the future potential for critical habitat to meet the recovery needs of this ESU. Does the proposed action reduce the existing ability of the habitat under the environmental baseline to provide safe passage for this ESU? In this case, the reduction in safe passage is due, in large part, to the operation that does not make maximum use of spillways, the safest route of in-river passage. The operation, however, does not reduce the future availability of spillways for safer passage. Since this capacity of existing critical habitat to safely pass fish is not reduced, the proposed action does not appreciably diminish the value of the critical habitat for recovery.

Another negative alteration of critical habitat that affects all the SR fall chinook juveniles that migrate in summer is the effect on the availability of shallow-water habitat in the Columbia River and its estuary below Bonneville Dam resulting from up-river storage dams. In a typical year, the modeling shows that during July and August, flows under the proposed action are reduced about 30,000 cfs. This causes a slight reduction in shallow-water juvenile rearing habitat in the lower river and estuary. The best available scientific information indicates that this reduction is likely to be less than 50-700 acres. This effect is expected to be mitigated by completion of estuarine habitat improvement actions during the 2010-2014 period³. The magnitude of the loss of shallow-water habitat in 2005-2010 would be small and would be a relatively minor, short-term alteration that would not appreciably diminish the value of this habitat for the survival or recovery of SR fall chinook.

³ See Footnote 30 in Section 6.4.

After considering all of these factors, NOAA Fisheries concludes that the proposed action would not be likely to destroy or adversely modify critical habitat for this ESU by appreciably diminishing the value of critical habitat for survival or recovery.

Under the Listing Condition Approach applied in Section 6.0, there is no adverse modification or destruction of critical habitat possible because there is not likely to be any alteration of essential features of critical habitat below their condition at the time this ESU was listed.

8.4 UCR SPRING CHINOOK SALMON

After reviewing the current status of UCR spring chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers, productivity, and distribution by a Medium amount for all populations and for the single major population group (Section 6.0). Beneficial actions that would be phased in during the term of the proposed action would result in an improvement by 2010.

Number of Major Population Groups: There is only one major population group, which is composed of three extant populations, in this ESU (Section 4.0), so its viability is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers, productivity, and distribution of the single major population group in this ESU (Section 6.0). Beneficial actions that would be phased in during the term of the proposed action would result in an improvement by 2010.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is an endangered species. The BRT reported that, through 2001, most populations experienced both long-term and short-term declines, but abundance was high in 2001 for all populations. Dam counts and preliminary spawner surveys also indicate generally higher than average abundance of wild stocks in 2002 and 2003. Mean aggregate (wild and hatchery) returns in 2001-2003 are over 1000% higher than mean aggregate returns during 1996-2000. Aggregate returns also indicate a positive trend in abundance in recent years. The BRT expressed strong concern regarding risk to the natural component of the ESU with respect to the abundance and productivity VSP categories and comparatively less concern over spatial structure and diversity. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that UCR spring chinook salmon artificial production programs provide benefits to ESU abundance, have no effect on spatial structure, provide benefits relative to preservation of diversity in some instances, and have uncertain effects on ESU productivity. Overall, hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor used by UCR spring chinook, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams and USBR projects, coupled with baseline effects of FERC projects in the mid-Columbia River and mainstem harvest rates, are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: Direct juvenile survival rates through FCRPS projects are uncertain for UCR spring chinook but are known with relative certainty for SR spring/summer chinook salmon, which are very similar in terms of migration timing and biological requirements. These estimates represent the effects of a combination of discretionary annual operations and the environmental baseline (the existence of FCRPS and USBR projects and non-discretionary hydro operations). NOAA Fisheries’ ability to distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult to precisely describe the limits of some areas of the Action Agencies’ discretion, and because it is difficult to define and model a reference operation that maximizes the survival of listed fish. The magnitude of latent mortality of in-river migrants, including any differences in this measure between the reference and proposed operation, is highly uncertain. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed hydro action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain.

Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. No improvement was assumed in the net effects analysis from estuarine habitat restoration, reflecting the uncertainty associated with effects of the proposed estuarine habitat actions on this ESU. Because estimates of benefits for UCR spring chinook tributary habitat projects are uncertain, NOAA Fisheries considered these benefits to be at the Low end of the Medium range in the net effects analysis.

Summary: Most factors indicate high risk for the UCR spring chinook ESU, both range-wide and in the action area. Because there is only a single major population group and because its poor status both range-wide and in the action-area is caused largely by the effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), tolerance for additional risk to this ESU is “low.” One factor indicating a degree of tolerance for additional short-term risk is the increased adult returns in recent years. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action poses an additional risk to the ESU.

Whereas the net reduction would be Medium early in the term of the proposed action, beneficial actions would reduce the effect to “no change” and perhaps to a net improvement by 2010. Strong returns of adults in recent years suggest that this lag in achieving beneficial effects would not have serious consequences. For these reasons, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.5 UWR CHINOOK SALMON

After reviewing the current status of UWR chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries’ opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single major population group (Section 6.0) and could result in an improvement.

Number of Major Population Groups: There is only one major population group, which is composed of seven extant populations, in this ESU (Section 4.0), so its viability is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single major population group (Section 6.0).

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that it is very difficult to determine trends in abundance and productivity for the natural component of the ESU, because there are no direct estimates of natural-origin spawner abundance. The BRT concluded that the natural component of the ESU had moderately high risk for all four VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that UWR chinook salmon artificial production programs provide slight benefits to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity. Collectively, hatchery programs do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. However, as described in Section 5.0, habitat-related biological requirements of juvenile UWR chinook salmon are not being fully met in the action area. The significant baseline effects of FCRPS and USBR projects and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are "reasonably certain to occur" in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: There are no quantitative estimates of the effect of the proposed action on this ESU. While specific effects of hydro operations on estuary and plume habitat are uncertain, the

relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the avian predation program are uncertain for this ESU. NOAA Fisheries assumed no improvement for yearling migrant UWR chinook salmon from estuarine habitat restoration in the net effects analysis, reflecting the uncertainty associated with predicting the effects of the proposed action on this ESU. There was also some uncertainty associated with the estimate of a Medium improvement from estuarine habitat actions for the subyearling component of the ESU.

Summary: Because no net reduction in numbers, reproduction, or distribution is expected as a result of the combination of proposed hydro and off-site actions, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.6 LCR CHINOOK SALMON

After reviewing the current status of LCR chinook salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets initially reduce numbers, productivity, and distribution by a "low to medium" amount for two of the six major population groups, but by the end of the proposed action period, there is "no change" or possibly an improvement for all six major population groups.

Number of Major Population Groups: The presence of six extant major population groups in this ESU (Section 4.0) means that it is less likely that the viability of any single group is significant for this ESU's survival and recovery, compared to ESUs with fewer major population groups.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets reduce numbers, productivity, and distribution of two of the six extant major population groups initially (Section 6.0), but by the end of the proposed action period, there is "no change" or possibly an improvement for all major population groups.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that most populations have exhibited pronounced increases in abundance and productivity in recent years, although the abundance of naturally produced spawners is uncertain. Despite recent improvements, long-term trends are below replacement for the majority of populations in the ESU. The BRT concluded that the natural component of the ESU had moderately high risk for all VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that LCR chinook salmon artificial production programs provide slight benefits to ESU abundance, spatial structure, and diversity but have neutral or uncertain effects on ESU productivity. Overall, hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU, described in Section 4.0. Adult passage at Bonneville Dam as experienced by individuals from two MPGs is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating toward the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects, including Bonneville Dam, and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams, USBR projects and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: Direct juvenile survival rates through the Bonneville project for the two affected major population groups are uncertain for LCR chinook, because direct estimates are not available. Except for juveniles from the Hood, Sandy, and Kalama populations, LCR chinook emigrate as subyearlings, so the most similar ESU for which estimates are available is the SR fall chinook ESU. As described in Section 8.3, the survival estimates for SR fall chinook are also uncertain, and because SR fall chinook pass through Bonneville pool and dam at a much larger size than LCR chinook, their survival rate could be higher. These SR fall chinook estimates represent the effects of a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries’ can distinguish between juvenile survival associated with discretionary annual hydro operations and environmental baseline conditions is uncertain both because it is difficult to describe the limits of some areas of the Action Agencies’ discretion and because it is difficult to define and model a reference operation

that would maximize the survival of listed fish. The magnitude of latent mortality of the component of the ESU that migrates through Bonneville pool and dam, including any differences in this measure between the reference and proposed operation, is highly uncertain.

There are no quantitative estimates of the effect of the proposed hydro action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring and fall flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program for two major population groups that originate above Bonneville Dam are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. Uncertainty was associated with estimation of the estuarine habitat restoration effects on this ESU.

Summary: There is a mix of high and low risk considerations for the LCR chinook ESU, both range-wide and in the action area. Because biological requirements are not being fully met in the action area, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), tolerance for additional risk to this ESU is low. However, recent adult returns indicate reduced range-wide risk, at least in the short term, and some tolerance for additional short-term risk. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action would pose an additional risk to the ESU. No additional risk would be likely by 2010 for any major population groups. However, two of the six major population groups would be expected to experience an initial “low to medium” reduction as a result of lower spill and passage survival at Bonneville Dam than in the reference operation. Because of the pronounced increases in abundance and productivity of this ESU in recent years, it is unlikely that the delay in implementing estuary restoration projects would significantly increase the risk of extinction of the ESU as a whole during the lag period. Because of the short duration of net adverse impacts for only two of the six MPGs, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of this ESU.

8.7 SR STEELHEAD

After reviewing the current status of SR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries’ opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The net combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers and productivity by a Low amount for the six major population groups in this ESU (Section 6.0). Beneficial actions

that would be phased in during the term of the proposed action would be expected to reduce the negative effects to “no change” by 2010-2014.

Number of Major Population Groups: The presence of six major population groups in this ESU (Section 4.0) means that it is less likely that the viability of any single group is significant for this ESU’s survival and recovery, compared to ESUs with fewer major population groups.

Proportion of Major Population Groups Reduced: The net combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would be to initially reduce numbers and productivity by a Low amount for the six major population groups in this ESU (Section 6.0). Beneficial actions that would be phased in during the term of the proposed action would be expected to reduce the negative effects to “no change” by 2010-2014.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that, through 2001, available census information indicated mixed trends in abundance and productivity. The BRT concluded that the natural component of the ESU had moderately high risk for the abundance, diversity, and productivity VSP categories and comparatively lower risk for spatial structure. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that many populations within the LCR chinook ESU have exhibited pronounced increases in abundance and productivity in recent years. SR steelhead artificial production programs provide slight benefits to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity. Overall, hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams, USBR projects, and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of

further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline..

Uncertainty: Direct juvenile survival rates through FCRPS projects are known with relative certainty for SR steelhead. These estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult to describe the limits of some areas of the Action Agencies' discretion and also difficult to define and model a reference operation that would maximize the survival of listed fish. The average post-Bonneville differential survival of transported juveniles, relative to non-transported juveniles (D), is fairly well-known for this ESU, based on large sample sizes obtained in empirical studies conducted in recent years. The magnitude of latent mortality of in-river migrants, including any differences in this measure between the reference and proposed operation, is highly uncertain. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed hydro action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. Because estimates of benefits for SR steelhead tributary habitat projects are uncertain, NOAA Fisheries considered these benefits Very Low in the net effects analysis.

Summary: There is a mix of high and low risk considerations for the SR steelhead ESU, both range-wide and in the action area. High mortality in the action area, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), indicates relatively high risk. However, recent adult returns indicate reduced range-wide risk, at least in the short term, and some tolerance for additional short-term risk. Whereas the net reduction would be Low early in the term of the proposed action, beneficial actions would reduce the effect to "no change" and perhaps to a net improvement by 2010 and beyond. Strong returns of adults during recent years suggest that a short-term lag in achieving beneficial effects would not have serious consequences. For these

reasons, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.8 UCR STEELHEAD

After reviewing the current status of UCR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would reduce the numbers, productivity, and distribution of the single major population group in this ESU by a Medium amount initially (Section 6.0). Beneficial actions that would be phased in during the term of the proposed action would reduce the negative effects to "no change" and possibly an improvement by 2010.

Number of Major Population Groups: There is only one major population group, composed of four extant populations, in this ESU (Section 4.0), so its viability is significant for the ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers, productivity, and distribution of the single major population group in this ESU (Section 6.0). Beneficial actions that are phased in during the term of the proposed action reduce the negative effects to "no change" by 2010, so no populations are affected at that point.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is an endangered species, although in its June 14, 2004 status review and proposed listing determination, NOAA Fisheries has proposed redesignation to threatened status. The BRT reported that, through 2000, most populations experienced long-term declines, but abundances were higher in 2001 for all populations. Dam counts and preliminary spawner surveys also indicate higher than average abundance levels in 2002 and 2003. In the 2004 status review, NOAA Fisheries reported that the last 2–3 years (through 2001) had seen an encouraging increase in the number of naturally produced fish in the UCR steelhead ESU. A preliminary analysis indicates that the slope of the natural-origin population trend increased 9.2% (from 0.97 to 1.06,) when the data for 2001-2003 were added to the 1990-2000 series, reversing the decline and indicating, at least in the short term, that the run size has been increasing. The BRT found high risk to the natural-origin component of the ESU with respect to the productivity VSP category but comparatively lower risk for the other categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that UCR steelhead artificial production programs provide benefits to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity. Overall, hatchery programs collectively mitigate the immediacy of extinction risk of the ESU in-total in the short term, but the contribution of these programs in the foreseeable future is uncertain.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU (described in Section 4.0). Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, habitat-related biological requirements of juveniles are not fully met within the action area. The significant baseline effects of FCRPS dams and USBR projects, coupled with baseline effects of FERC projects in the mid-Columbia River and mainstem harvest rates, are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: Direct juvenile survival rates through FCRPS projects are uncertain for UCR steelhead but are known with relative certainty for SR steelhead, which are very similar in terms of migration timing and biological requirements. These estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies’ discretion and to define and model a reference operation that would maximize the survival of listed fish. The magnitude of latent mortality of in-river migrants, including any differences in latent mortality between the reference and proposed operations, is highly uncertain. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. Because estimates of benefits for UCR steelhead tributary habitat projects are uncertain, NOAA Fisheries considered these benefits to be at the Low end of the Medium range in the net effects analysis.

Summary: Although its status has been improving recently, most factors indicate high risk for the UCR steelhead, both range-wide and in the action area. Because of the single major population group and poor action-area status, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), tolerance for additional risk to this ESU is low. However, recent adult returns indicate reduced range-wide risk, at least in the short term, and some tolerance for additional short-term risk. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action poses an additional risk to the ESU. While, initially, the net reduction would be Medium over the term of the proposed action, beneficial actions would reduce the effect to “no change” and perhaps to a net improvement by 2010. Strong returns of adults during recent years suggest that the lag in achieving beneficial effects would not have serious consequences. For these reasons, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.9 MCR STEELHEAD

After reviewing the current status of MCR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries’ opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers, productivity, and distribution of all five extant major population groups by a Medium amount (Section 6.0), but by the end of the proposed action period, there would be either no change or an improvement for all major population groups.

Number of Major Population Groups: The presence of five major population groups in this ESU (Section 4.0) means that it is less likely that the viability of any single group is significant for this ESU’s survival and recovery, compared to ESUs with fewer major population groups.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce numbers, productivity, and distribution of all five extant major population groups (Section 6.0), but by the end of the proposed action period, there would be “no change” or possibly an improvement for all major population groups.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that, through 2001, most populations experienced long-term declines and positive short-term trends. In its Status Review, NOAA Fisheries noted that the abundance of natural populations in the MCR steelhead ESU increased substantially in 2001 over the previous 5 years. The Deschutes and Upper John Day rivers had recent 5-year mean abundance levels in excess of their respective interim recovery target abundance levels (NMFS 2002b). Preliminary results for 2002 indicate that the slope of the population trend for natural-origin fish increased 6.2% (from 0.99 to 1.05) when the data for 2001-2002 were added to the 1990-2000 series, indicating that, at least in the short run, the natural-origin population has been increasing. The BRT concluded that the natural component of the ESU had moderate risk for all VSP categories, with the greatest relative risk attributed to the ESU abundance category. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that MCR steelhead artificial production programs provide slight benefits to ESU abundance, a negligible contribution to spatial structure, and neutral or uncertain effects on ESU productivity and diversity. Overall, hatchery programs collectively do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating toward the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams, USBR projects, and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has

conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline..

Uncertainty: Direct juvenile survival rates through FCRPS projects are uncertain for MCR steelhead but are known with relative certainty for SR steelhead, which are very similar in terms of timing and biological requirements. These SR steelhead survival estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies' discretion and to define and model a reference operation that would maximize the survival of listed fish. The magnitude of latent mortality of in-river migrants, including any differences in latent mortality between the reference and proposed operation, is highly uncertain. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. Because estimates of benefits from improvements from the John Day habitat projects are uncertain, NOAA Fisheries counted these benefits as Very Low in the net effects analysis. Hatchery effects were also uncertain and therefore considered to have Very Low benefits.

Summary: There is a mix of high and low risk considerations for the MCR steelhead ESU, both range-wide and in the action area. Because of the poor status in the action area, caused largely by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), tolerance for additional risk to this ESU is low. However, recent adult returns indicate reduced range-wide risk, at least in the short term, and some tolerance for additional short-term risk. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action would pose an additional risk to the ESU. No additional risk is likely by 2010 for any major population groups. However, all five major population groups would be expected

to experience a Medium reduction initially. Strong returns of adults during recent years suggest that the lag in achieving beneficial effects would not have serious consequences. For these reasons, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.10 UWR STEELHEAD

After reviewing the current status of UWR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single major population group (Section 6.0).

Number of Major Population Groups: There is only one major population group, composed of seven extant populations, in this ESU (Section 4.0), which means that its viability is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single major population group (Section 6.0).

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that the ESU experienced significant increases in adult returns in recent years, but all populations in the ESU have experienced long-term declines. The BRT concluded that the natural component of the ESU had moderate risk for all VSP categories.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU (described in Section 4.0). However, as described in Section 5.0, the mainstem habitat-related biological requirements of juveniles are generally not being fully met in the action area. The significant baseline effect of FCRPS and USBR projects is a key factor influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are "reasonably certain to occur" in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the

consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: There are no quantitative estimates of the effect of the proposed action on this ESU. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of effects of off-site improvements were uncertain for this ESU.

Summary: Because no net reduction in numbers, reproduction, or distribution is expected as a result of the combination of proposed hydro and off-site actions, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

8.11 LCR STEELHEAD

After reviewing the current status of LCR steelhead, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce the numbers, productivity, and distribution of two of the four extant major population groups by a Medium amount (Section 6.0), but by the end of the proposed action period, there would be either "no change" or an improvement for all major population groups.

Number of Major Population Groups: The presence of four major population groups in this ESU (Section 4.0) means that it is less likely that the viability of any single group is significant for this ESU's survival and recovery, compared to ESUs with fewer major population groups.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would initially reduce the numbers, productivity, and distribution of two of the four extant major population groups by a Medium amount (Section 6.0), but by the end of the proposed action period, there would be no change or an improvement for all major population groups.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that most populations have experienced both long-term and short-term declines. In its Status Review, NOAA Fisheries noted that some anadromous populations in the LCR steelhead ESU, particularly summer-run steelhead populations, had shown encouraging increases in abundance in the 2 to 3 years ending 2001. The BRT concluded that the natural

component of the ESU had moderate risk for each of the VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that LCR steelhead artificial production programs provide slight benefits to ESU abundance, spatial structure, and diversity but have neutral or uncertain effects on ESU productivity. Collectively, hatchery programs do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU (described in Section 4.0). Adult passage at Bonneville Dam for two MPGs is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects, including Bonneville, and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams and USBR projects are a key factor influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline..

Uncertainty: Direct juvenile survival rates through the Bonneville project are uncertain for LCR steelhead but are known with relative certainty for SR steelhead, which are very similar in terms of migration timing and biological requirements. These SR steelhead survival estimates represent the effects of a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies’ discretion and to

define and model a reference operation that would maximize the survival of listed fish. The magnitude of latent mortality of the component of the ESU that migrates through Bonneville pool and dam, including any difference in latent mortality between the reference and proposed operations, is highly uncertain. Survival of adults past the Bonneville project under proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program for the major population groups above Bonneville Dam are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. There is also uncertainty in the estimate of the effects of hatchery actions.

Summary: There is a mix of high and low risk considerations for the LCR steelhead ESU, both range-wide and in the action area. Because of the poor status in the action area, caused in part by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline (represented by the reference operation), tolerance for additional risk to this ESU is low. However, recent adult returns indicate reduced range-wide risk, at least in the short term, and some tolerance for additional short-term risk. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU would constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action would pose an additional risk to the ESU. No additional risk would be likely by 2010 for any of the major population groups. However, two of the four major population groups would be expected to experience a Medium reduction initially. Strong returns of adults during recent years suggest that the lag in achieving beneficial effects would not have serious consequences. Because of the short duration of the net reduction and its restriction to two of the four major population groups, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of this ESU.

8.12 CR CHUM SALMON

After reviewing the current status of CR chum salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): Assuming that there is an extant population above Bonneville Dam, proposed hydro operations and hydro configuration changes would reduce the abundance, productivity, and distribution of one of the three extant major population groups by a Low amount initially (Section 6.0), but by the end of the proposed action period, there would be "no change" or a possible improvement for all major population groups.

Number of Major Population Groups: The presence of only three major population groups in this ESU (Section 4.0) means that it is likely that the viability of each population group is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: Assuming there is an extant population above Bonneville Dam, proposed hydro operations and hydro configuration changes would initially reduce the abundance, productivity, and distribution of one of the three extant major population groups by a Low amount (Section 6.0), but by the end of the proposed action period, there would be no change or a possible improvement for all major population groups.

Range-wide Status of the ESU: As described in Section 4.0, this ESU is a threatened species. The BRT reported that, through 2001, long- and short-term productivity trends for ESU populations were at or below replacement. Abundance increased dramatically in 2002, but when 2003 preliminary returns are included, the 2001-2003 mean is lower than the 1996-2000 mean abundance. Even with this decline in mean abundance in 2003, preliminary analysis of the population trend indicates a stable population growth rate between 1990-2003. The BRT concluded that the natural component of the ESU had high risk for all of the VSP categories, particularly for ESU spatial structure and diversity. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that recently initiated CR chum salmon artificial production programs provide slight benefits to ESU abundance and spatial structure but have neutral or uncertain effects on ESU productivity and diversity. Collectively, hatchery programs do not substantially reduce the extinction risk of the ESU in-total.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU described in Section 4.0. Adult passage at Bonneville Dam for one MPG could be effective, but FCRPS flow management can limit the amount of and access to spawning habitat just below Bonneville Dam. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects, including Bonneville, and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams, USBR projects, and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations

expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: There are no quantitative estimates of the effect of the proposed action on this ESU. If there is an extant population in the Gorge major population group, fish that migrate through Bonneville pool and dam as juveniles and adults could experience mortality within the range estimated for other ESUs, but this assumption is very uncertain. While specific effects of hydro operations on mainstem spawning habitat and estuary and plume rearing habitat are uncertain, the relatively small difference between the reference and proposed operations for winter spawning and incubation flows, spring migration flows, and water quality are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain for the single major population group that might still spawn above Bonneville Dam, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). There was also uncertainty in the estimate of the effects of estuarine habitat restoration and hatchery actions.

Summary: There is a mix of high and low risk considerations for the CR chum salmon ESU, both range-wide and in the action area. Because of the poor status in the action area, caused in part by effects of the FCRPS and USBR projects that are included in the hydro portion of the environmental baseline represented by the reference operation, tolerance for additional risk to this ESU is low. The main consideration in determining if the reduced numbers, productivity, and distribution of this ESU constitute an appreciable reduction in the likelihood of survival and recovery is the degree to which the proposed action poses an additional risk to the ESU. No additional risk would be likely by the end of the term of the proposed action for any major population groups. However, if there is an extant population above Bonneville Dam, one population in one of the three major population groups would be expected to experience a Low reduction initially. The great uncertainty regarding the existence of a population above Bonneville Dam and the stable population trend between 1990-2003 suggest that the lag in achieving beneficial effects would not have serious consequences for the ESU. Because of the short duration of the net reduction and its restriction to, at most, one of the three major population groups, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of this ESU.

8.13 SR SOCKEYE SALMON

After reviewing the current status of SR sockeye salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is

NOAA Fisheries' opinion that the proposed action is not likely to jeopardize the continued existence of this species or adversely modify or destroy designated critical habitat.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single extant population in this ESU (Section 6.0).

Number of Major Population Groups: There is only one extant population in this ESU (Section 4.0), so its viability is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of the single extant population in this ESU (Section 6.0).

Range-wide Status of the ESU: As described in Section 4.0, this ESU is an endangered species. Only 16 naturally-produced adults have returned to Redfish Lake since the ESU was listed in 1991. The BRT found extremely high risk in all four VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that the SR sockeye salmon captive broodstock artificial production program has prevented extinction of the ESU but has not mitigated the BRT's assessment of extreme risk in all four VSP categories.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU (described in Section 4.0). Adult passage at existing dams is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, the mainstem habitat-related biological requirements of juveniles are not being fully met within the action area. The significant baseline effects of FCRPS dams, USBR projects and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in determining whether these harmful actions are "reasonably certain to occur" in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the

consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: There are no quantitative estimates of the effect of the proposed action on this ESU. Direct juvenile survival rates through FCRPS projects are assumed to be somewhat lower than the survival rates of SR spring/summer chinook and SR steelhead. This assumption is very uncertain. The SR spring/summer chinook and SR steelhead survival estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies' discretion and to define and model a reference operation that would maximize the survival of listed fish. The average post-Bonneville differential survival of transported SR sockeye juveniles, relative to non-transported juveniles (D), and the magnitude of latent mortality of in-river migrants, including any differences in latent mortality between the reference and proposed operation, is unknown. Survival of adults through the hydro system under the proposed action is relatively certain.

Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust. No improvement was assumed in the net effects analysis from estuarine habitat restoration, reflecting the uncertainty associated with effects of the proposed habitat restoration on this ESU. The determination that artificial propagation measures would increase the viability of the ESU by a Medium amount is also uncertain.

Summary: Because no net reduction in numbers, reproduction, or distribution is expected as a result of the combination of proposed hydro and off-site actions, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.

Critical Habitat: As described in Section 6.14.3.2, using the Environmental Baseline Approach, the proposed action would negatively impact the essential feature of safe passage in critical habitat the juvenile migration corridor between 2005 and 2009, but there is a high degree of uncertainty regarding the expected effect in the period from 2010 to 2014. If the effect on SR sockeye salmon is like that on SR spring/summer chinook salmon, a net improvement in safe passage conditions would be expected between 2010 and 2014. However, if the effect is more like that described for SR steelhead, the essential feature of safe passage would continue to be altered during this period. The magnitude of the reduction in safe passage relative to the

reference operation would be significant during the first five years, even considering immediate expansion of the northern pikeminnow removal program. The magnitude of the effect during the second five years would be reduced, possibly to zero.

The purpose of safe passage, relative to “survival or recovery” of a listed species, is a survival rate through the migratory corridor that would be sufficient to support increasing populations up to at least a recovery level. The in-river survival rate necessary for recovery is currently unknown. Safe passage and other essential features of critical habitat in the juvenile migration corridor under the environmental baseline are poor. The juvenile migration corridor has been greatly modified by the existence of the FCRPS dams, reservoirs, and non-discretionary hydro operations, as described in Section 5.0. A significant proportion of the migrating juveniles is transported around most FCRPS dams in order to avoid the baseline passage conditions. No actions that are properly considered cumulative effects are expected to change the status of critical habitat in the juvenile migration corridor. The range-wide status of the ESU is described above. It is extremely poor, with continued existence of the ESU dependent upon a captive broodstock program.

After considering all of these factors, NOAA Fisheries concludes that the proposed action would not be likely to adversely modify or destroy designated critical habitat for this ESU. This conclusion is based primarily on the determination that, by the sixth year of this proposed action, the condition of critical habitat in the juvenile migration corridor either would be equivalent to the condition associated with the reference operation or reduced by a relatively small amount, which is not considered “appreciable.” Significant structural improvements would be expected to remain in place long after 2014.

Additionally, it is important to recognize that the current management strategy for the SR sockeye salmon does not rely for the survival of the species on maintenance of fully optimal conditions in the designated juvenile migration corridor critical habitat. Currently, almost all of the SR sockeye found within the hydro system are the result of a hatchery program funded entirely by the Action Agencies. The hatchery program is operated at a level sufficient to overcome the small losses resulting from the proposed operations as compared to baseline operations, as well as the sometimes substantial incidental take that occurs when harvest is allowed on unlisted sockeye in the Columbia River. Thus, the relatively small short-term impact to critical habitat resulting from the proposed action is not likely to appreciably diminish the value of critical habitat either for the survival or recovery of the ESU.

Under the Listing Condition Approach applied in Section 6.0, there is no adverse modification or destruction of critical habitat possible, because there is not likely to be any alteration of essential features of critical habitat below their condition at the time this ESU was listed.

8.14 LCR COHO SALMON

After reviewing the current status of LCR coho salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects in the action area, it is NOAA Fisheries’ opinion that discretionary hydro operations are not likely to jeopardize the continued existence of this species.

Magnitude of Reduction(s): The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets is not likely to reduce numbers, productivity, diversity, or the distribution of any of the four major population groups (Section 6.0).

Number of Major Population Groups: The presence of only three major population groups in this ESU (Section 4.0) means that it is likely that the viability of each population group is significant for this ESU's survival and recovery.

Proportion of Major Population Groups Reduced: The combination of proposed hydro operations, hydro configuration changes, and non-hydro offsets would not be likely to reduce numbers, productivity, diversity, or the distribution of any of the four major population groups (Section 6.0).

Range-wide Status of the ESU: As described in Section 4.0, this ESU has been proposed as a threatened species. The BRT reported that the two populations with appreciable natural productivity experienced increased returns in 2000 and 2001 but continue to have low abundance and productivity. The BRT concluded that the natural component of the ESU had extremely high risks in all VSP categories. The June 14, 2004 status review and proposed listing determinations for salmon and steelhead indicated that LCR coho salmon artificial production programs reduce risks to ESU abundance and spatial structure, pose risks to ESU diversity, and have uncertain effects on ESU productivity. Overall, hatchery programs collectively mitigate the immediacy of ESU extinction but do not substantially reduce the extinction risk of the ESU in-total in the foreseeable future.

Status of the ESU in the Action Area (Environmental Baseline): Since all of the fish in this ESU pass through at least part of the action area, the status of the ESU in the action area is essentially the same as the range-wide status of the ESU (described in Section 4.0). Adult passage at Bonneville Dam for one MPG is effective. As described in Section 5.0, the construction of the hydro system has severely degraded habitat in the juvenile migration corridor of this ESU, resulting in high levels of mortality for juvenile fish migrating towards the ocean. Beginning in the 1980s, and especially in the last decade, the Action Agencies have made a series of structural and operational improvements at FCRPS projects, including Bonneville, and, in many cases, these modifications have significantly improved the survival of juvenile fish within this ESU during their passage through the hydro system. However, habitat-related biological requirements of juveniles are not being fully met in the action area. The significant baseline effects of FCRPS dams, USBR projects and mainstem harvest rates are key factors influencing ESU status in the action area.

Cumulative Effects: As described in Section 7.0, few actions (either adverse or beneficial) have been identified that would meet the reasonably certain to occur test and therefore qualify as cumulative effects. Nevertheless, NOAA Fisheries identified a number of state, Tribal, or private actions that have frequently occurred in the past and may well occur or even increase in the near future. Most, if not all, of these actions are harmful and have significantly contributed to the current degraded habitat. If these harmful actions were to cease when their current authorizations expire, habitat conditions would be expected to eventually improve. Due to the difficulty in

determining whether these harmful actions are “reasonably certain to occur” in the absence of further specific assistance from state, Tribal, or local governments, NOAA Fisheries has conservatively assumed that current levels of harm will continue at least through the end of the consultation period (2014). Depending on the specific action involved, this assumption both overestimates adverse cumulative effects (for authorizations that end prior to 2014) and underestimates adverse cumulative effects (for authorizations that end after 2014). The effect of this assumption is that NOAA Fisheries anticipates that the cumulative effects of state, Tribal, or private actions over the consultation period (2004-2014) will generally approximate the effects of frequently occurring past state, Tribal, or private actions that were included in the environmental baseline.

Uncertainty: There are no quantitative estimates of the effect of the proposed action on this ESU. For the few hatchery-origin populations that migrate through Bonneville pool and dam, direct juvenile survival rates are assumed to be similar to the survival rate of other yearling spring migrants (SR spring/summer chinook salmon and SR steelhead). This assumption is very uncertain. The SR spring/summer chinook and SR steelhead survival estimates represent a combination of discretionary annual operations and the environmental baseline (i.e., existence of the FCRPS and USBR projects and non-discretionary hydro operations). The precision with which NOAA Fisheries can distinguish between juvenile survival associated with discretionary annual operations and environmental baseline conditions is uncertain, because it is difficult both to describe the limits of some areas of the Action Agencies’ discretion and to define and model a reference operation that would maximize the survival of listed fish. The magnitude of latent mortality of in-river migrants, including any differences in this measure between the reference and proposed operation, is unknown. Survival of adults through the hydro system under the proposed action is relatively certain.

There are no quantitative estimates of the effect of the proposed action on this ESU below Bonneville Dam. While specific effects of hydro operations on estuary and plume habitat are uncertain, the relatively small difference in spring flows and lack of a difference in water quality between the reference and proposed operations are fairly certain. Estimates of the improvements expected from the continued and expanded pikeminnow program are uncertain for the one major population group above Bonneville Dam, but NOAA Fisheries accounted for this uncertainty by estimating only a Low survival improvement (Section 6.3.2.4). Estimates of the specific improvements expected from the avian predation program for this ESU are uncertain, because some level of compensatory mortality could occur. NOAA Fisheries evaluated the impact of a range of assumptions about compensatory mortality and found that its conclusion was fairly robust.

Summary: Because no net reduction in numbers, reproduction, or distribution is expected as a result of the combination of proposed hydro and off-site actions, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of the ESU.